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09/994,142	11/26/2001	Meijie Zhang	P24,841-A USA	9602
7590 10/14/2003				
Synnestvedt & Lechner LLP 2600 Aramark Tower 1101 Market Street Philadelphia, PA 19107-2950				
EXAMINER DOVE, TRACY MAE				
ART UNIT 1745		PAPER NUMBER		

DATE MAILED: 10/14/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/994,142

Applicant(s)

ZHANG, MEIJIE

Examiner

Tracy Dove

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 November 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) 14-26 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 November 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 1-13, drawn to a lithium battery, classified in class 429, subclass 232.
- II. Claims 14-26, drawn to a method of reducing capacity fade rate of a lithium battery, classified in class 29, subclass 623.1.

The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the product may be made by another and materially different process. Specifically, the coating may be applied to the lithium insertion compound by various methods.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

Because these inventions are distinct for the reasons given above and the search required for Group II is not required for Group I, restriction for examination purposes as indicated is proper.

During a telephone conversation with Peter Butch on 8/26/03 a provisional election was made with traverse to prosecute the invention of Group I, claims 1-13. Affirmation of this election must be made by applicant in replying to this Office action. Claims 14-26 are

withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Priority

Applicant's claim for domestic priority under 35 U.S.C. 120 is acknowledged. However, the parent application 09/795,235 upon which priority is claimed fails to provide adequate support under 35 U.S.C. 112 for claim 13 of this application. The parent application does not disclose a dimethyl carbonate organic solvent.

Information Disclosure Statement

The information disclosure statements (IDS) submitted on 11/26/01 and 10/21/02 have been considered by the examiner.

Claim Objections

Claim 2 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 2 broadens the temperature limitation of claim 1. Specifically, claim 2 includes temperatures of 650°C or greater.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 5 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

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Claim 5 recites the phrase “greater than about 0.01%”, which is indefinite because it is unclear what the phrase encompasses. Specifically, for example, 0.0099% is “about 0.01%”, but not “greater than 0.01%”. Thus, it is unclear if the claim encompasses “0.0099%”. Examiner suggests “greater than or equal to 0.01%”.

Claims Analysis

The term “LiCoO₂ type structure” in claim 6 is defined by the specification at page 3, lines 28-30. A “LiCoO₂ type structure” is defined as LiCoO₂ or LiNi_xCo_{1-x}O₂ ($0 \leq x \leq 1$).

The specification recites the term “lithium borate” is used to refer to any lithium-boron-oxide compound (page 8, lines 1-2).

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 2, 5, 9, 11 and 12 are rejected under 35 U.S.C. 102(b) as being anticipated by Amatucci et al., US 5,705,291.

Amatucci teaches a rechargeable lithiated intercalation battery cell (lithium ion battery) having reduced self-discharge comprising a negative electrode, a nonaqueous electrolyte and a positive electrode wherein the surfaces of the aggregate lithiated intercalation composition particulates comprising the positive cell electrode have been coated with a passivating layer of a composition comprising a borate or a lithiated borate (abstract). The battery includes a separator between the positive and negative electrode (col. 2, lines 60-65). The negative electrode is a

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lithium insertion carbon compound (col. 3, lines 10-13). The nonaqueous electrolyte includes a LiPF_6 salt and a mixed nonaqueous solvent of ethylene carbonate and dimethyl carbonate (col. 3, lines 19-22). Example 1 teaches a LiMn_2O_4 intercalation compound was mixed with about 1% of weight of H_3BO_3 and the mixture was heated at about 800°C to coat the surfaces of the intercalation compound with the borate (col. 4, lines 35-39). Example 3 teaches that lithiated borate (instead of borate) was used in amounts of 0.4%, 0.6%, 0.8% and 1.0% by weight to surface treat portions of LiMn_2O_4 powder, as described in Example 1 (col. 5, lines 26-32). Amatucci teaches that the coating film may be annealed on the surface of the intercalation compound particles at a temperature in excess of about 400°C .

Thus the claims are anticipated.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-12 are rejected under 35 U.S.C. 102(b)/103(a) as being anticipated by, and alternatively unpatentable over, Uehara et al., JP 09-330720 (a machine translation of the Japanese patent is attached).

Uehara teaches a lithium battery having a positive electrode including a lithium transition metal compound oxide, a negative electrode including a lithium material or a material capable of storing and releasing lithium ion, and a nonaqueous electrolyte. At least part of the particle surface of the lithium transition metal compound oxide is covered with a compound containing

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lithium and boron. Uehara teaches a lithium battery having reduced capacity fade rate (abstract).

A multiple oxide containing lithium and boron such as LiBO_2 or $\text{Li}_2\text{B}_4\text{O}_7$ may be used to cover the lithium transition metal compound positive electrode material (0011). The coating

compound is contained in an amount of 0.1-20% based on the lithium transition metal compound

(0012). The lithium transition metal compound positive electrode material may be

$\text{LiNi}_{0.5}\text{Co}_{0.5}\text{O}_2$ (0032). The negative electrode material may be lithium, a lithium alloy or a

carbon material such as graphite (0016). The electrode includes an electrolyte salt such as LiPF_6

and an organic solvent such as propylene carbonate, ethylene carbonate, diethyl carbonate,

dimethyl carbonate or mixtures thereof (0018-0019). Uehara teaches the lithium transition metal

oxide and the lithium-boron-oxide containing compound are mixed and heated to a temperature

of 650°C (0039 and 0044). The battery includes a separator 3, as shown in Figure 1. The

compound LiCoO_2 is encompassed by the general formula (1) disclosed by Uehara in paragraph

0014. Example 11 in Table 2 teaches $\text{LiNi}_{0.5}\text{Co}_{0.5}\text{O}_2$ with a coating of 2 mol% of LiBO_2

(approximately 1 wt% of LiBO_2).

Thus the claims are anticipated.

The claims are alternatively unpatentable because the courts have ruled that product-by-process limitations, in the absence of unexpected results, are obvious. See MPEP 2113. The heat treatment temperature of Uehara (650°C) is just outside of the heat treatment temperature range of the claimed invention (250°C to less than 650°C). Thus, the coated positive electrode material of Uehara and the coated positive electrode material of the claimed invention appear to be the same.

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Claims 3 and 4 contain product-by-process limitations which are considered obvious in the absence of unexpected results. See MPEP 2113. Specifically, whether the lithium borate and lithium insertion compound are dry mixed or mixed in an aqueous solution, the coated lithium insertion compound, as an end result, appears to be the same.

»

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Uehara et al., JP 09-330720 in view of Gosho et al., US 6,589,694.

Uehara teaches a lithium battery having a positive electrode including a lithium transition metal compound oxide, a negative electrode including a lithium material or a material capable of storing and releasing lithium ion, and a nonaqueous electrolyte. At least part of the particle surface of the lithium transition metal compound oxide is covered with a compound containing lithium and boron. Uehara teaches a lithium battery having reduced capacity fade rate (abstract). A multiple oxide containing lithium and boron such as LiBO_2 or $\text{Li}_2\text{B}_4\text{O}_7$ may be used to cover the lithium transition metal compound positive electrode material (0011). The coating compound is contained in an amount of 0.1-20% based on the lithium transition metal compound (0012). The lithium transition metal compound positive electrode material may be $\text{LiNi}_{0.5}\text{Co}_{0.5}\text{O}_2$ (0032). The negative electrode material may be lithium, a lithium alloy or a carbon material such as graphite (0016). The electrode includes an electrolyte salt such as LiPF_6 and an organic solvent such as propylene carbonate, ethylene carbonate, diethyl carbonate, dimethyl carbonate or mixtures thereof (0018-0019). Uehara teaches the lithium transition metal oxide and the lithium-boron-oxide containing compound are mixed and heated to a temperature of 650°C (0039 and 0044). The battery includes a separator 3, as shown in Figure 1. The

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compound LiCoO_2 is encompassed by the general formula (1) disclosed by Uehara in paragraph 0014. Example 11 in Table 2 teaches $\text{LiNi}_{0.5}\text{Co}_{0.5}\text{O}_2$ with a coating of 2 mol% of LiBO_2 (approximately 1 wt% of LiBO_2).

Uehara does not explicitly teach that the nonaqueous solvent is a mixture of ethylene carbonate (EC), propylene carbonate (PC), diethyl carbonate (DEC), ethyl methyl carbonate (EMC) and dimethyl carbonate (DMC).

However, Gosho teaches lithium secondary battery having positive electrode including a lithium transition metal composite oxide active material, a negative electrode including a graphite active material and a nonaqueous electrolyte including a salt and a solvent (col. 8, lines 15-48). The lithium transition metal composite oxide is preferably a Li-Co type composite oxide, particularly preferably LiCoO_2 (col. 6, lines 14-23). Table 9 discloses various nonaqueous electrolytes having an LiPF_6 salt and a solvent mixture of EC, PC, DEC, EMC and DMC (Ex. 30-34, 36 and 37).

Therefore, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because one of skill would have been motivated to use the organic solvent mixture of Gosho for the organic solvent of Uehara in order to inhibit lowering of discharge capacity and intermediate voltage at low temperature. One of skill would have been motivated to adjust the mixing ratio of the components of the electrolyte solvent to improve low temperature characteristics of the battery (col. 31, lines 65-col. 32, lines 4). Uehara discloses using EC, PC, DEC and DMC as organic solvents for the electrolyte (only EMC is not disclosed by Uehara). One of skill would have been motivated to combine the teaching of Uehara and Gosho because both are directed toward lithium secondary batteries having lithium

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transition metal oxide positive electrodes and graphite negative electrode. Both references teach nonaqueous electrolytes having a LiPF_6 salt and a solvent containing cyclic and linear organic carbonate solvents.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Evans 4,465,747 teaches a manganese-dioxide containing positive active material coated with a lithium-boron-oxide material.

Yoshimura 6,509,120 teaches a lithium manganese oxide positive active material coated with a lithium-boron-oxide material.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tracy Dove whose telephone number is (703) 308-8821. The Examiner may normally be reached Monday-Thursday (9:00 AM-7:30 PM). My supervisor is Pat Ryan, who can be reached at (703) 308-2383. The Art Unit receptionist can be reached at (703) 308-0661 and the official fax numbers are 703-872-9310 (after non-final) and 703-872-9311 (after final).

A handwritten signature in black ink, appearing to read "Tracy Dove", written in a cursive style.

Tracy Dove
Patent Examiner
Technology Center 1700
Art Unit 1745

September 30, 2003